

California State University, San Bernardino

CSUSB ScholarWorks

Theses Digitization Project

John M. Pfau Library

2003

Instant access: Developing a high school web site for staff, students, and community

Keri Lynn Freestone

Follow this and additional works at: <https://scholarworks.lib.csusb.edu/etd-project>



Part of the [Instructional Media Design Commons](#)

Recommended Citation

Freestone, Keri Lynn, "Instant access: Developing a high school web site for staff, students, and community" (2003). *Theses Digitization Project*. 2303.

<https://scholarworks.lib.csusb.edu/etd-project/2303>

This Project is brought to you for free and open access by the John M. Pfau Library at CSUSB ScholarWorks. It has been accepted for inclusion in Theses Digitization Project by an authorized administrator of CSUSB ScholarWorks. For more information, please contact scholarworks@csusb.edu.

INSTANT ACCESS: DEVELOPING A HIGH SCHOOL WEB
SITE FOR STAFF, STUDENTS, AND COMMUNITY

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Education:
Instructional Technology

by
Keri Lynn Freestone

June 2003

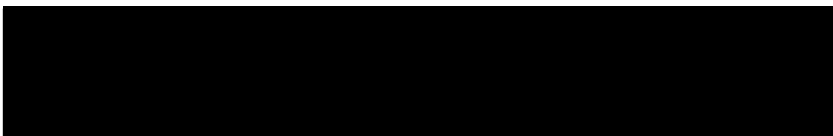
INSTANT ACCESS: DEVELOPING A HIGH SCHOOL WEB
SITE FOR STAFF, STUDENTS, AND COMMUNITY


A Project
Presented to the
Faculty of
California State University,
San Bernardino

by
Keri Lynn Freestone

June 2003

Approved by:


Dr. Eun-Ok Baek, First Reader


Dr. Amy Leh, Second Reader

6-5-03
Date

© 2003 Keri Lynn Freestone

ABSTRACT

A high school web site, one application of hypermedia, can be a powerful instructional and communication tool. This project describes the inception and development of a high school web site along with subsequent implementation issues, limitations, benefits, and recommendations. Visual design and learning principles and the history of hypermedia are also discussed, and a model is tendered for other schools to follow when constructing a web site.

DEDICATION

To my parents for their unfailing love and support through all times good and bad, and to Ken for giving me the chance to spread my wings--no one succeeds alone, and I could not have made it without the three of you.

TABLE OF CONTENTS

ABSTRACT iii

LIST OF FIGURES vii

CHAPTER ONE: BACKGROUND

 Introduction 1

 Purpose of the Project 2

 Context and Significance of the Project 2

 Limitations 3

 Limitations 4

 Delimitations 5

 Organization of the Thesis 6

CHAPTER TWO: REVIEW OF THE LITERATURE

 Introduction 7

 Development of Hypermedia 7

 Hypermedia in Education 9

 Disadvantages of Hypermedia 11

 Hypermedia Studies in Education 12

 Uses of Hypermedia 13

 Design Considerations for Hypermedia 21

 Web Site Design Considerations 27

 Designing a School Web Site 31

 Summary 32

CHAPTER THREE: METHODOLOGY

Introduction.....	35
Development.....	35
Defining Populations.....	35
Designing Site Architecture and Navigation.....	36
Creating Site Layout.....	38
Layout Changes.....	43
Content.....	45
Site Usability and Maintenance.....	49
Summary.....	51

CHAPTER FOUR: RECOMMENDATIONS FOR CONSTRUCTION OF A SCHOOL WEB SITE

Introduction.....	53
Steps in Web Site Construction.....	53
Define Populations to Be Served.....	53
Design Site Architecture and Navigation.....	54
Create Site Layout.....	55
Gather and Input Content.....	57
Evaluate Site Usability.....	57
Upload and Maintain the Site.....	59

CHAPTER FIVE: CONCLUSIONS

Introduction.....	61
-------------------	----

Conclusions.....	61
Summary.....	63
APPENDIX A: PACIFIC HIGH SCHOOL WEB SITE FLOW CHART.....	65
APPENDIX B: SURVEY OF PACIFIC HIGH SCHOOL WEB SITE.....	67
REFERENCES.....	74

LIST OF FIGURES

Figure 1. Unified Elements	23
Figure 2. Non-unified Elements	23
Figure 3. Focal Point by Contrast	24
Figure 4. Focal Point by Isolation	25
Figure 5. Symmetrical Balance	26
Figure 6. Asymmetrical Balance	26
Figure 7. Initial Web Site Layout Showing Unity, Focal Point, and Balance	39
Figure 8. Revised Web Site Layout	44

CHAPTER ONE

BACKGROUND

Introduction

Hypermedia, the newest form of educational technology, is used in kindergarten through twelfth grade schools, as well as in colleges and universities, to provide and support instruction and publish information. Its advent in education is relatively recent; however, use of this technology has grown significantly in concert with the rapid expansion of the Internet and the increase in popularity of constructivist learning theories. Hypermedia also follows several tenets of cognitivism, another popular learning theory, in that it allows both sequential and non-sequential access to information, similar to information retrieval in the brain (Thompson, Simonson, & Hargrave, 1996).

A web site, a collection of interlinked web pages, is one application of hypermedia and can be a powerful instructional and communication tool. This project will describe the inception and development of a high school web site along with subsequent implementation issues and recommendations. Visual design and learning principles and

the history of hypermedia will also be discussed along with their implications for hypermedia development.

Purpose of the Project

The purpose of this project is three-fold. The first objective is to describe hypermedia applications and summarize current research on the role and effectiveness of hypermedia. In particular, the project will focus on the application of hypermedia through Internet web sites. The second intention is to present a high school web site that is immediately usable to disseminate information and resources and to promote communication and public relations among school community members, i.e., staff, students, parents, alumni, local businesses and organizations, etc. The third purpose is to tender a model for other schools to follow when constructing their web sites.

Context and Significance of the Project

The project was designed to address the effective use of hypermedia, specifically a high school web site, to enhance classroom instruction and improve communication among school community members. A well-designed school web site can allow for ready access to varied resources for staff, students, and

parents. Many teachers and administrators, however, seem unaware of the uses and benefits of school web sites, and as a result, most kindergarten through twelfth grade schools do not have their own web sites.

This project presents a school web site that makes available a repository of school-related information that is immediately usable and easily updateable. The web site was developed around five main areas: school information, staff, students, parents, and calendars. Each section holds a collection of policies, procedures, tutorials, and other information resources for members of the school's community (staff, students, and parents). Its content structure and navigation system were based on solid design principles to facilitate ease of use.

Limitations

During the development of the project, a number of limitations and delimitations impacted the project's scope and depth. These limitations and delimitations are as follows.

Limitations

The following limitations apply to the project:

1. The time required to design and code this web site was much greater than initially anticipated. Professionally created web sites are typically developed by teams of people. While a web site can be developed and maintained by one individual, the caliber and size of such a web site does not equal one handled by a team of professionals.
2. Due to security restrictions, only the author was given uploading privileges to the web server for the school's web site. Any content created by other teachers (i.e., teacher web pages and syllabi) had to be screened, occasionally reformatted, and uploaded by the author. With over 100 teachers at the author's high school, this process was, at times, very involved and time consuming.
3. The author's beginning knowledge of HTML and web page design further restricted the project. Prior to this endeavor, the author had created only one other web site. The site created for this project

is well designed and instructionally sound; however, the author was not able to include some of the bells and whistles she had hoped.

4. Coordinating with other educators to review and test the site was challenging. Although the web site incorporates a plethora of instructionally sound resources, several teachers were hesitant to deviate from their standard practice and use an online information resource in place of hard copy resources like newsletters and books.

Delimitations

The following delimitations apply to the project:

1. The web site is housed on a server owned by the San Bernardino City Unified School District (SBCUSD). All content is subject to review by the district's superintendent or the superintendent's designee and must conform to SBCUSD guidelines.
2. The web site size was limited to 50 MB by SBCUSD protocols. While this limit seemed more than adequate at the project's inception, it became restrictive as the web site grew.

Organization of the Thesis

The thesis portion of the project was divided into five chapters. Chapter One provides an introduction to the purpose, context, significance, limitations, and delimitations of the project. Chapter Two consists of a review of relevant literature. Chapter Three documents the development the project. Chapter Four presents a model for creating a high school web site. Chapter Five presents conclusions and recommendations drawn from the development and implementation of the project, and project references follow Chapter Five.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

Hypermedia is the newest form of educational technology. In kindergarten through twelfth grade schools, as well as in colleges and universities, it is generally used for four purposes: 1) to deliver instruction, 2) to construct artifacts, 3) to assess student learning, and 4) to disseminate information. Hypermedia applications include web sites, presentations, simulations, problem solving activities, electronic textbooks, and assessment tools.

Development of Hypermedia

According to Jonassen (1996), hypermedia is the marriage of multimedia and hypertext. Multimedia is the integration of various forms of media--text, video, sound, graphics, animation, imaging, and spatial modeling--into one product. The different media are normally coordinated and controlled by a computer system. Hypertext is a nonlinear method of organizing text that allows a reader to control the sequence of what is read. Chunks of text, typically called nodes, are connected through associative links. The nodes and links

form an organized network of ideas that users navigate to access information.

Hypermedia, then, combines the assorted representations of multimedia with the random access capabilities of hypertext. It creates an individualized environment where users define access paths and sequences to retrieve large amounts of information (Marsh & Kumar, 1992). The learner controls what the technology delivers instead of the technology dictating the route the learner takes (Ewing, Dowling, & Coutts, 1999). Hypermedia electronically links related information, similar to the way authors provide footnotes, endnotes, sidebars, and bibliographies in traditional texts to refer readers to other pertinent information. It does not, however, require the user to physically leave the environment in which he is working to access the related information.

Despite its recent advent in education, some of the concepts behind hypermedia have been around for over 50 years (Heller, 1990; Marsh & Kumar, 1992). In 1945, Vannevar Bush, President Franklin D. Roosevelt's Science Advisor and the director of the Office of Scientific Research and Development, described a tool that would allow people to

access information from a large collection of microfilm. Certain mechanisms would be established to link any two pieces of information within the collection. While technology was not available to institute such a system at that time, current literature credits Bush as being the first to envision hypertext.

Hypermedia in Education

Use of hypermedia in recent years has increased along with the popularity of cognitive and constructivist learning theories. This is, in part, because the structure of hypermedia mirrors current cognitivistic knowledge acquisition models--learning occurs when new knowledge is assimilated into a preexisting network of knowledge.

Jonassen (1988) noted that "the more links that can be formed between existing knowledge and new knowledge, the better the information will be comprehended and the easier learning will be" (quoted in Marsh & Kumar, 1992, p. 27). Marsh and Kumar (1992) further stress that to maximize instructional effectiveness, new material should be presented in a way that mimics the brain's organizational structure. Hypermedia does just that by displaying material in a web-like fashion.

According to Ford and Chen (2000), "the types of knowledge

representation hypermedia affords are arguably closer than text-based representations to human associative and schema-based memory structures" (p. 282).

Another belief of hypermedia is that it helps learners develop a more robust understanding by giving them the opportunity to view a body of knowledge from many perspectives--a purely constructivist precept (Adams, 1996). Furthermore, learner control and environmental flexibility, two critical components of constructivism, are inherent in hypermedia (Thompson, Simonson, & Hargrave, 1996). Jonassen (1996) asserts that, "when learners actively construct knowledge, it is more meaningful, applicable, and memorable" (p. 13). The non-linear structure of hypermedia forces users to forge their own paths through material, to actively construct their own knowledge.

Other factors that have contributed to the growth of hypermedia in education include the following: 1) the improvement of hypermedia authoring software, 2) the ease of creating and tracing references, 3) the ability to modularize and link information, and 4) the ability to investigate several topics at once (Heller, 1990). Furthermore, hypermedia affords a wide range of design options as it can

facilitate the sequential access patterns typical of traditional print media in addition to previously touted non-sequential access patterns (Ford & Chen, 2000). An explosion in the number of education web sites and an increase in user-friendly web authoring programs have also positively impacted educational hypermedia use.

Disadvantages of Hypermedia

Notwithstanding previously mentioned benefits, hypermedia does have inherent disadvantages. Disorientation is the problem most often cited for hypermedia. Other problems include a lack of structure, cognitive overload, declining commitment, unmotivated rambling, learner distraction, and difficulty integrating acquired information into personal knowledge structures (Evans & Edwards, 1999; Heller, 1990; Jonassen, 1996; Marsh & Kumar, 1992; McDonald & Stevenson, 1999; Senn & Horton, 1996; Thompson, Simonson, & Hargrave, 1996).

The lack of structure noted above often causes users to miss parts of hypermedia products. Users do not know what information exists or cannot find it (McDonald & Stevenson, 1999). Evans and Edwards (1999) and Misanchuk, Schweier and Boling (2000) observed that when navigating large quantities

of information, it can be difficult to determine where one is, how to return to the main page, how to return from a diversion, or how to get where one is going. The vast amounts of information often included in hypermedia can also induce users to focus more on browsing and navigation than on efficient learning (Ewing, Dowling, & Coutts, 1999). This is particularly evident with users who are unfamiliar with hypermedia or unfamiliar with a particular hypermedia application. When a user has to focus on discerning the navigation scheme of a hypermedia application, the user's comprehension of the application's content is diminished. This is similar to the learning curve associated with reading. When a reader is bogged down in trying to decode individual words in a passage, ". . .she [has] limited attentional capacity remaining to focus on comprehending" (Reutzel & Cooter, 1992, p. 37).

Hypermedia Studies in Education

Because of its relative infancy, the number of studies conducted on hypermedia is somewhat limited. Research was available on using hypermedia and the Internet for delivery of instruction, artifact construction, and assessment; and preliminary results seem to imply that the interactivity of

hypermedia can positively affect student learning (Evans & Edwards, 1999; Ewing, Dowling, & Coutts, 1999; Thompson, Simonson, & Hargrave, 1996). In regards to school web sites, the author did locate a few scholarly articles depicting design considerations for hypermedia applications, one scholarly article on setting up an education web site, and several articles in various non-scholarly magazines that reviewed existing school web sites or discussed setting up new web sites. None of the articles addressed the effects of education web sites on staff, students, parents, or community members, however.

Uses of Hypermedia

Deliver Instruction. Various forms of hypermedia have been used to deliver instruction. Internet web sites, hypermedia stacks, interactive videodisc (IVD), and interactive CD-ROM are all forms mentioned in research literature. In addition, Marsh and Kumar (1992) mention the use of hypermedia to establish electronic libraries and student-centered computerized textbooks. The world's entire scientific and literary data could be linked through interconnected databases, providing an easy way to research and trace references. Replacing traditional textbooks with

hypermedia textbooks would allow readers to "unlock a book, ask questions, and explore any information at their own convenience" (p.29).

In 1996, Chagas and Abegg conducted a study to determine the effects of introducing hypermedia, specifically IVD, in two sixth grade middle school science classrooms. While previous research focused mostly on students, this study highlighted the effects of hypermedia on teachers and only briefly touched on effects on students. Motivation, planning, implementation, and hypermedia perceptions were analyzed and discussed for both teachers. The primary motivation for implementation seemed to stem from the desire of both teachers to enlarge their teaching strategies repertoire and to be viewed as technological innovators. Motivation appeared to decrease after the training phase, however, when the teachers realized the amount of time required to integrate hypermedia in their classrooms.

Both teachers acknowledged an increase in student independence and problem solving and a change in classroom interactions after IVD use. The hypermedia programs gave students more control over their learning pace and a better sense of their own understanding. Perhaps as a result of

that, students exhibited problem-solving strategies at hypermedia stations that were not observed at other lab stations. Teachers acted as facilitators and let IVD groups work independently most of the time. More student-student and student-teacher interactions were noted at hypermedia stations, whereas teacher-student interactions decreased.

The National Science Foundation (NSF) and the Office of Educational Research and Improvement (OERI) have also sponsored research projects dealing with hypermedia integration (Marsh & Kumar, 1992). One project at Vanderbilt University, similar to the study described above, focused on the use of videodisc technology with a hypermedia presentation to allow pre-service teachers to see classroom applications of certain instructional strategies. Another Vanderbilt project utilized hypermedia to provide anchored language arts and social studies instruction to a group of average and below-average fifth grade students. A third Vanderbilt project used hypermedia to develop mathematical problem solving. Preliminary findings for the three projects seem to indicate that the hypermedia format leads to self-motivated investigation, spontaneous use of targeted skills, and increased proficiency in noticing context.

Other researchers have also supported using hypermedia presentations in education. Marsh and Kumar (1992) stated that hypermedia use could affect future curriculum design and promote inquiry. Since it offers more learner control over the learning process, it could be used to accommodate differences in the rate of knowledge acquisition among students. It could also help in presenting anchored instruction and simulations, in integrating learning across subject areas, and in developing expert-like thinking. Hypermedia allows students to manipulate variables in problem-solving environments and discover important features and relationships on their own.

Construct Artifacts. While the previously mentioned hypermedia applications dealt with delivery of instruction, hypermedia has also been used for the construction of artifacts. Wisnudel (1994) stated that through the process of designing and building hypermedia artifacts, students learn to organize information, make connections, and draw relationships between ideas and concepts.

Studies have included students creating hypermedia stacks, web sites, simulations, and multimedia demonstrations to teach certain topics or to display complex conceptual

relationships. Other projects have focused on developing assessment schemas for analyzing hypermedia artifacts. One researcher noted that "students who build and use hypermedia apparently develop a proficiency to organize knowledge about a subject in a more expert-like fashion" (Wisnudel, 1994, pp. 10-11).

Wisnudel (1994) listed three other benefits to using hypermedia for constructing artifacts. First, it is motivating to students. When students have autonomy to create hypermedia artifacts using self-selected images, sounds, videos, and text, they are engaged in an authentic learning activity—an activity that has "aesthetic, utilitarian, or personal value apart from [its] value in documenting the competence of the learner" (p. 6). Second, the process of designing and building hypermedia artifacts helps students to develop complex mental skills like breaking down a topic into subtopics, gathering data, organizing information, formulating questions, and converting information into knowledge. Third, constructing hypermedia artifacts follows constructivist learning theories by engaging students in assimilating new information with previous knowledge. Students not only consider new ideas,

but they think of how concepts are interrelated and structured. Learners can also develop collaboration skills and enhance individual understanding when working in groups to construct hypermedia artifacts. In accordance with the constructivist perspective, Shepardson and Britsch (1996) stated that:

The potential interactivity of the hypermedia must be accompanied by active engagement in situations with others that require the learner to operationalize his underlying ideas, thus revealing true concept formation. If not, learning by hypermedia becomes nothing more than a passive search for memorizable information, or the matching of available textual data with tangentially or disparately related conceptual impressions (pp. 15-16).

Assessment Tool. In the past, computerized assessment has taken multiple forms and has offered several benefits over traditional paper and pencil testing (Helgeson & Kumar, 1993). First, it provides immediate feedback to students that can enhance learning. Second, it can quickly evaluate large amounts of repetitive student data. Third, it can greatly simplify record keeping. Fourth, it allows for self-paced instruction and individualized, adaptive testing. Fifth, the availability of large test item banks simplifies test development for teachers. Sixth, the data collection capability of computers makes possible more extensive data

analysis of test items. Seventh, the ease of computerized test taking improves student attitudes toward test taking.

While it does not have some of the benefits of standard computerized assessment, hypermedia offers a promising way to meet the call for reforms in assessment. Helgeson and Kumar state that "with the emergence of hypermedia, there is increased flexibility of assessment allowing for a potentially better match between the way in which humans construct knowledge and methods for assessing such learning" (1993, p. 240). Concept mapping and cognitive task analysis provide valuable insights into analyzing learning processes. They are easily representable through hypermedia using nodes to represent concepts and links to represent relationships between nodes.

Another option is to use hypermedia stacks or web sites for assessment purposes. Hypermedia authoring software can be used to create problem-based projects. These can simulate tasks involved in traditional paper and pencil tests while providing a non-linear visual environment for problem solving.

Disseminate Information. Hypermedia, and Internet web sites in particular, can be used to quickly disseminate

information to a wide range of people. Once a novelty in the educational arena, school web sites are gaining in number and popularity across the country. Such web sites are used to broadcast information geared specifically for students, staff, and parents, such as school calendars, school policies, handbooks, student grades and schedules, faculty biographies and contact information, learning goals, mission statement, homework assignments, library catalogs and databases, school-business partnerships, student newspapers, forms for downloading, and resource links (Caro, 2001; Clyde, 2002; Nixon, 2002; Palfrey, 2000; Shaw, 2002; Simkins, 1996).

Effective school web sites reflect and support the mission of a school and are not simply showcases of technology wizardry (Shaw, 2002). The information presented is useful, timely, and accurate; and the content is well organized and easy to navigate.

Although they are not yet widely used in education, school web sites have one primary advantage over other forms of hypermedia and over print media: revisions to web sites can be made quickly and easily with very little expense (Palfrey, 2000; Terry, 1999). When changes are made to books, pamphlets, CD-ROMs, or other tangible media, copies of

the revisions must be made and then distributed--a sometimes lengthy and expensive process. Web site revisions, however, are instantly available to anyone with an Internet connection worldwide.

Design Considerations for Hypermedia

Because of the previously cited disadvantages of hypermedia, a hypermedia application's navigation scheme must be well designed to minimize disorientation and maximize understanding of the application's content. Inclusion of a map, menus, or indices describing major and minor topics have been shown to facilitate navigation by increasing the amount of material reviewed and decreasing the number of nodes repeatedly opened during browsing (McDonald & Stevenson, 1999; Child, 1999). Studies cited by Evans and Edwards (1999) caution, however, that while maps aid in information retrieval, they can hamper educational purposes by interfering with a user's ability to form an internal representation of information. In some instances, maps can actually increase the cognitive overload they are designed to alleviate. Heller (1990) noted that maps may "become difficult to understand as the material represented in cyberspace becomes vast. . . . [If] the user is uninitiated

into the content area represented, the map will be hard to use, much like a street map that is based on symbols foreign to the tourist is difficult for the tourist to adjust to" (p. 432).

Another design consideration for hypermedia applications is the incorporation of visuals. According to studies cited by Szabo and Kanuka (1999), visuals can enhance the learning process by positively affecting visual cognition, the process of perceiving and remembering information. One theory is that the brain stores words and images separately, and this dual coding increases recall. When the brain houses more than one mental representation for something, the redundancy strengthens memory. Another benefit is that if one memory trace is absent, the other can be accessed.

Employing the visual design principles of unity, focal point, balance, and rhythm can also impact user comprehension--positively or negatively (Lightfoot, 2000; Misanchuk, Schwier, & Boling, 2000; Szabo & Kanuka, 1999). Unity gives a piece cohesion or consistency. Elements look as though they belong together, and the whole dominates above the parts. Unity can be achieved through proximity, repetition, and continuation (see Figures 1 and 2).

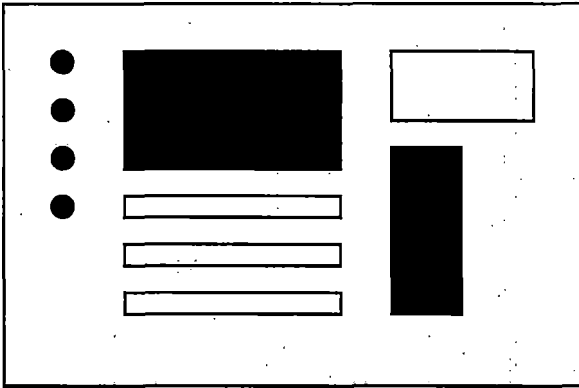


Figure 1.

Unified Elements

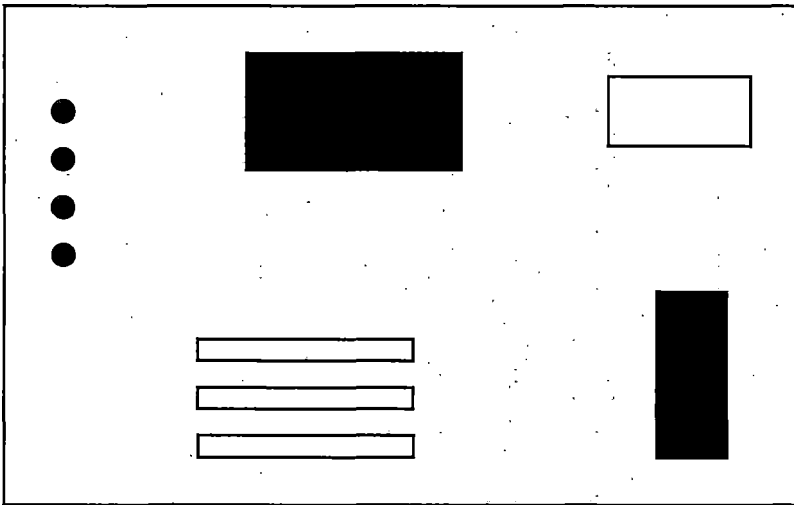


Figure 2.

Non-unified Elements

In any design, "it is effective to have one feature repeatedly draw the eye" (Allen & Stimpson, 1990, p. 117). A focal point, or point of emphasis, attracts a user's attention and encourages further perusal. Focal points are typically created through contrast (Figure 3) and/or isolation (Figure 4).

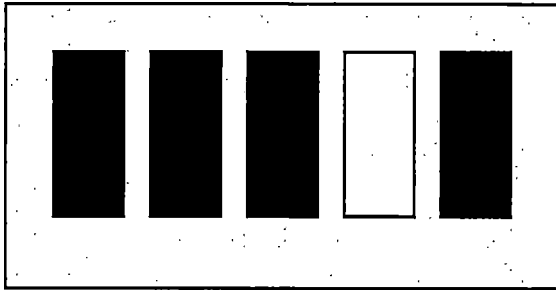


Figure 3.

Focal Point by Contrast

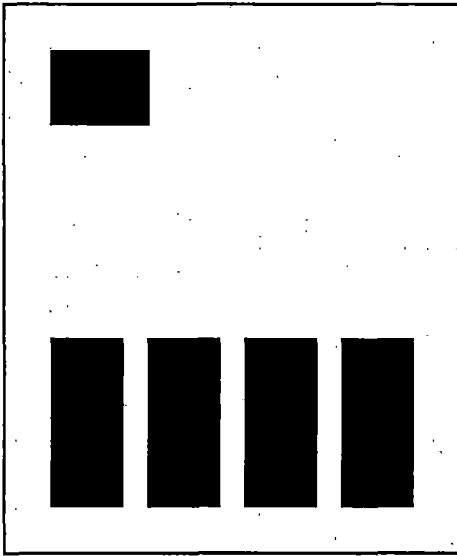


Figure 4.

Focal Point by Isolation

Balance provides a sense of equilibrium and repose. It can be symmetrical or asymmetrical. When objects of the same general shape and size are placed an equal distance from a center point, the result is symmetrical balance (Figure 5). Objects of different sizes and shapes can be placed to achieve asymmetrical balance (Figure 6). Asymmetrical balance is more difficult to achieve but remains interesting for a longer period of time (Allen & Stimpson, 1990).

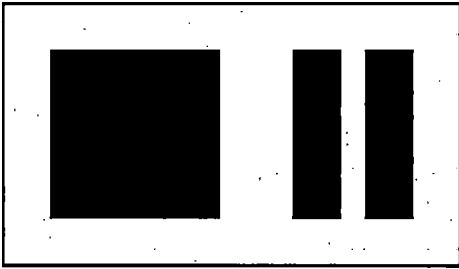


Figure 5.

Symmetrical Balance

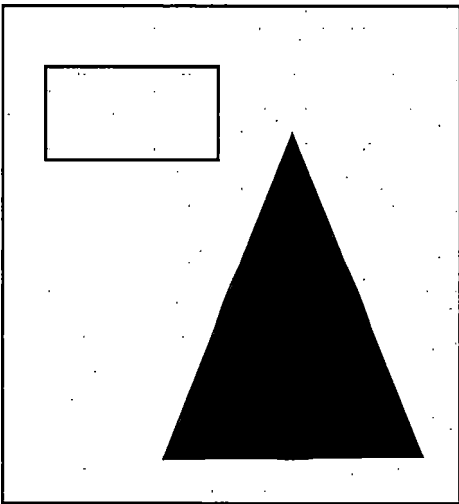


Figure 6.

Asymmetrical Balance

"Rhythm is an intangible component. . .that assists the eye in moving. . .from one area to another" (Allen &

Stimpson, 1990, p.116). It helps create continuity and interest and can be achieved through repetition, opposition, transition, gradation, radiation, and contrast.

In a hypermedia application, appropriate use of the above mentioned principles can attract and retain a user's attention and lead to decreased instructional time. Szabo and Kanuka (1999) assert that when multimedia designers utilize these principles, ". . .multimedia learners are capable of making better choices and are more capable at gathering information from environments that are text and visually rich" (p. 27). When these principles are ill-applied or not applied at all, however, the opposite is also true. Poor choices in text or image placement, image size, typography, background, or color can detrimentally affect legibility and comprehension, increase instructional time, and reduce completion rate (Misanchuk, Schwier, & Boling, 2000; Szabo & Kanuka, 1999).

Web Site Design Considerations

Several other design factors should be considered when building a web site. In addition to the aforementioned principles, a web designer also needs to be concerned about site architecture, a user interface, information delivery,

method of feedback, download time, and browser compatibility (Burch, 2001; Misanchuk, Schwier, & Boling, 2000). Site architecture is the organization of a web site's components. It dictates the flow of content on a web site along with how users access information. An efficient architecture facilitates easy access to site resources and information while an inefficient architecture contributes to user disorientation and increased instructional time.

"The user interface is the appearance and functionality of a site. It is how the user requests the information on a web site and how that web site presents the requested information" (Burch, 2001, p.359). The interface can include hyper-linked text, drop-down navigational menus, and navigational link graphics like arrows or a home to get a user to different sections.

Information delivery and mode of feedback can be accomplished through a variety of methods. Text, audio, video, images, animations, chat rooms, bulletin boards, threaded discussions, and web conferencing are all options for disseminating information on a web site. Users can respond to a web site's content through e-mail, chat rooms,

instant messaging, threaded discussions, bulletin boards, list servers, and web conferencing.

Download time is the amount of time needed for a web page to display completely on a user's computer after entering that page's address. It is affected by the size of graphics or animation on a page, the processor speed and amount of RAM on the user's computer, the user's Internet access mode--i.e., telephone modem, DSL, cable modem, satellite, T1 line, etc.--and to a certain extent, how the page was coded. The industry standard for a good download time is six seconds or less. To keep download times short, web pages should be designed for the lowest common denominator. Graphic, video, audio, and animation file sizes should be kept small, and these elements should be used only when pertinent to the page's content. No matter how professional a web page looks and how much useful information it contains, if it takes too long to download, a user will lose interest and go elsewhere (Burch, 2001).

Web browser compatibility is another consideration in web site design. While Hypertext Markup Language (HTML), the programming language used to create most web sites, is meant to work cross platform, Misanchuk, et al (2000) caution

against believing “. . .that HTML is HTML, and will display the same, no matter which platform, and which company's browser is used” (p. 235). The same web page can display quite differently on a Macintosh computer than it does on a PC, and quite differently in *Internet Explorer* than it does in *Netscape*. Web designers must test their pages cross platform and in different browsers to ensure workability.

Another issue relating to browser compatibility is the use of frames. Frames divide sections of a web page into different windows within the main browser window. These separate windows, called frames, allow portions of a page's content to remain stationary while other portions scroll or change. While the concept of frames is quite powerful, they do not work consistently between browsers, and older browser versions do not support frames. Similar issues apply when incorporating other web page extras like JAVA, JavaScript, streaming audio or video, FLASH, and Shockwave. These features do not work consistently cross platform or cross browser, so designers should check their work in a variety of venues to ensure compatibility.

One of the previously mentioned benefits of web pages over print media is the ease of making and publishing changes

(Palfrey, 2001; Terry, 1999). With such facility, and to encourage users to visit regularly, web site content should be kept as up-to-date as possible (Simkins, 1996). If a site's content never changes or if time sensitive material is not updated regularly, users will stop visiting the site and potential benefits will be lost (Lightfoot, 2000).

Designing a School Web Site

A school web site has many prospective instructional and communicative benefits. First, it can provide information for staff who have missed meetings or students who have missed class. Second, it can streamline communication with staff, students, and parents by housing handouts, syllabi, assignments, notices, and other information normally published on paper. Students, staff, and parents ". . .do not need to worry about losing paper copies of handouts because extra copies can be downloaded at any time" (Lightfoot, 2000, p. 22). Third, if needed, changes can be easily posted and made instantly available without necessitating mass re-printing. Fourth, the web site can include e-mail links to staff to increase access to school personnel. Students can e-mail assignments to teachers, students and teachers can communicate about homework

questions, parents and staff can communicate about student concerns, and staff can communicate with each other about any number of school-related issues. In addition, a time stamped record of this correspondence is created for future reference. Finally, barring any technological difficulties, the web site can be accessed 24 hours a day, seven days a week—a timeframe that far exceeds normal school or office hours—from any location with Internet access.

Summary

Hypermedia has great potential in an educational setting. Instructional use has increased in recent years due to an increase in popularity of constructivist learning theories. Educational applications include assessment, dissemination of information, artifact construction, and delivery of instruction.

A school web site can be a powerful hypermedia application. It can provide a number of easily updateable and accessible resources, streamline communication between the school and the community, and increase accessibility to staff.

Despite the benefits of hypermedia, it has inherent problems that need to be considered and overcome. Most frequently mentioned is the tendency for users to become disoriented. Several researchers have suggested including maps, indices, or guided tours in systems to facilitate navigation (Child, 1999; Heller, 1990; Marsh & Kumar, 1992; McDonald & Stevenson, 1999; Thompson, Simonson, & Hargrave, 1996), but studies conducted by Senn and Horton (1996) and McDonald and Stevenson (1999) indicated that while such navigational aids help reduce disorientation, they do not enhance student performance or facilitate learning.

A second problem with hypermedia is its lack of explicit structure. "The less structured hypertext is, the less likely users are to integrate what they have learned" (Jonassen, 1988, quoted in Marsh & Kumar, 1992, p. 35).

The sheer volume of information available coupled with the evaluative decision-making needed to navigate is a third problem, particularly for inexperienced users. Oftentimes a ". . . system is so rich with information and perspectives, that the user, student or teacher, is put into a state of cognitive overload" (Heller, 1990, p. 433). Cognitive

overload can also lead to a fourth problem—maintaining the user's commitment to the system.

Incorporating principles of visual design in a hypermedia project can enhance the usefulness of the application. Implementation of the principles of balance, unity, rhythm, and focal point create an aesthetically pleasing environment that attracts and retains the users attention.

In addition to the principles cited above, when designing a web site, the site architecture, user interface, download time, browser compatibility, information delivery and method of feedback must also be taken into account. An efficient site architecture and a solid navigational scheme diminish user disorientation and maximize understanding. Pages should be constructed with compressed graphic, video and audio files to minimize download time.

CHAPTER THREE

METHODOLOGY

Introduction

The project was developed in a series of six stages: 1) defining the populations to be served, 2) designing the site architecture and navigation scheme, 3) creating the site layout or "look and feel," 4) gathering and inputting content, 5) evaluating the site usability, and 6) uploading and maintaining the site. The project took nearly two years to develop and is still being revised by the author (see <http://misntl.sbcusd.k12.ca.us/pacific>). The author never intended the web site to be static. It was, instead, designed to be a living, breathing entity—something that would be regularly modified and updated to address the needs of the populations served. In that sense, the project will never be "complete."

Development

Defining Populations

The primary populations served in any school setting are students, parents, and staff. As such, the author decided to focus on these segments as the principal audience for the web

site. In addition, because of the worldwide accessibility of an Internet site, the author included alumni and local community members as a secondary audience. Informational needs for all groups--i.e., meeting notices, school and district policies, student activity and sporting events schedules, school organization, etc.--were then considered and subsequently formed the foundation of the web site content.

Designing Site Architecture and Navigation

Once the general content was determined, the author began constructing a flow chart to outline the web site's architecture (see Appendix A). The site was organized around five main areas--staff, school information, students, parents, and calendars. The staff, student, and parent sections contain information pertinent to those audiences; the school information section contains general information about school procedures, organization, and history; and the calendar section contains information about scheduled events throughout the school year.

To facilitate navigation among the different sections and to combat the sense of disorientation cited in Chapter Two, the author incorporated several navigational tenets

throughout the web site. First, links to each of the aforementioned five sections were included on every page of Pacific's web site. Through these links, the user is able to get to other sections easily from anywhere in the web site and always has a way to get back to familiar territory, if needed. Second, links to external sites were set to open in new browser windows, so a user is able to peruse different web sites while maintaining a connection to Pacific's web site. Then, no matter how far a user wanders from Pacific's site, he or she is able to return simply by closing the new window. Third, return links were included on pages when appropriate. For example, the Staff Roster page contains links to individual pages for every teacher at Pacific High School. Each teacher page then has a link back to the Staff Roster page. Fourth, pages whose content length necessitates scrolling have "back to top" links to allow users to quickly return to the top of the page.

As the number of pages in the web site grew, the need for some sort of index or cataloguing feature became quickly apparent. Users needed a way to instantly locate specific information in the mass of pages. While the solid design of web site's architecture facilitated this, the author decided

to include a search tool to further aid in locating information. With this feature, a user can type in a word or phrase, and the search engine returns a list of links to pages on the web site containing that word or phrase.

Creating Site Layout

In developing the look and feel of the web site, the author previewed numerous professionally created web sites to get layout design ideas. After looking at a multitude of news, sports, university, entertainment, and retail web sites and considering the design principles named in Chapter Two, the author developed a design template for each page (see Figure 7). Each page had a width of 745 pixels and a solid purple bar running the length of the left edge. The purple bar contained page content navigation links and a graphic link to the SBCUSD web site. Across the top of the page were two things--a title bar and links to the home page and the five main sections of the web site. The remaining major section of the page had a white background and contained the body text and images of the page.

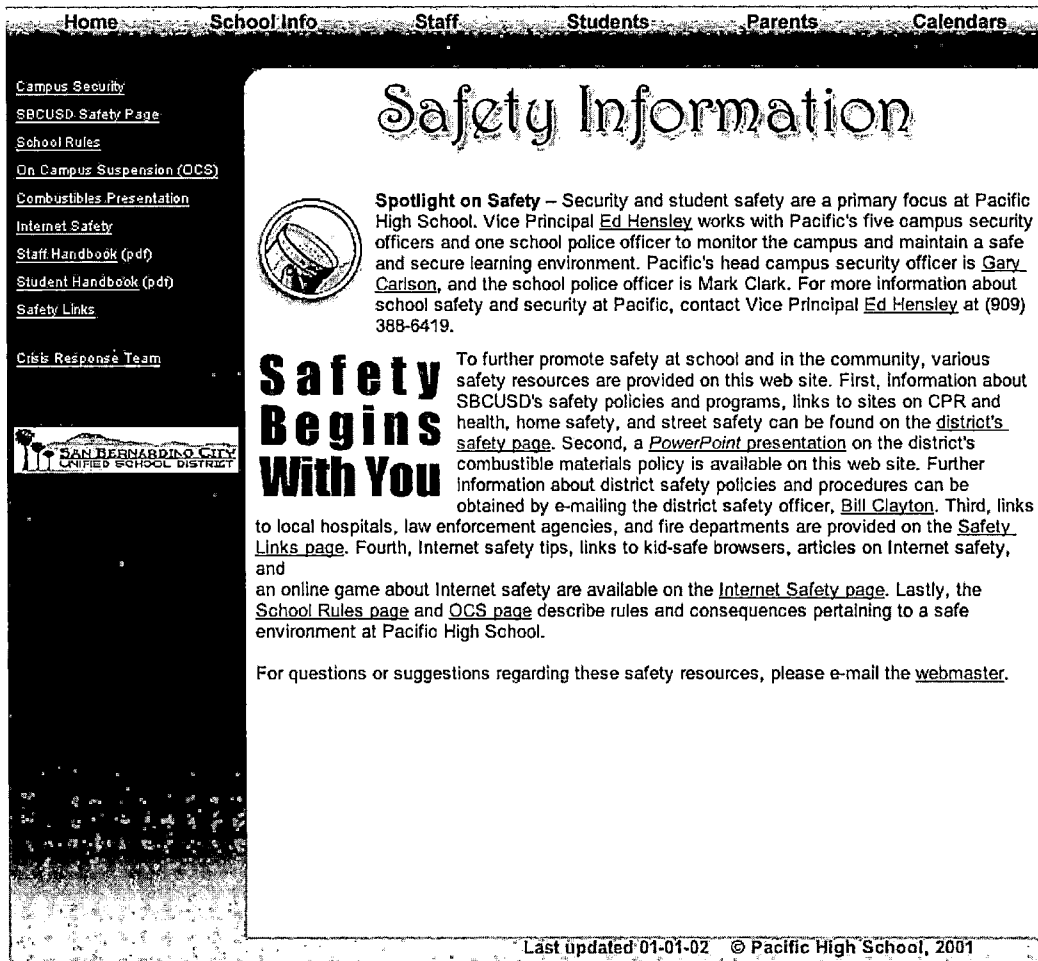


Figure 7.

Initial Web Site Layout Showing Unity, Focal Point, and Balance

As seen in Figure 7, unity was achieved through proximity and color blocking, a focal point was created through contrast, and balance was created through an asymmetrical arrangement of elements. The solid blocks of background color--purple in the navigation bar along the left

edge, gray in the navigation bar across the top, and white in the body of the page--and the arrangement of elements within each area created unity. The larger font size in the title bar contrasted with the smaller font size of the body text made the title bar a focal point for each page. The heavier grouping of body text on the white background next to the smaller grouping of navigation links on the purple background created an asymmetrical balance on each page.

Unity throughout the site was further achieved through a standardization of text font, size, style, and color. The text for the body of each page was regulated to the same font, size, color, and style (Arial or Helvetica, size 2, black, plain), as were the text for body headings (Arial or Helvetica, size 3, purple, bold), the left navigation bar links and copyright (Arial or Helvetica, size 1, white, plain), and the left navigation bar last modified date (Arial or Helvetica, size 1, white, italic). Arial and Helvetica were chosen as the base fonts because they are similar in appearance and common on most computers. If a web page calls for a font not installed on a computer, the browser substitutes the requested font with a different one, distorting the look of the page from what the designer

intended. Harrington, a font not common to most computers, was initially chosen as the font for the title bar of each page. To ensure that all users would see the titles as intended, the author saved them as images in the program Adobe *Photoshop*. This was done because images render consistently on different computers and in different browsers, thus evading the font substitution problem.

Another concern in the layout design was the construction method of the site. Developers have basically two options when building web sites—use an authoring program like Adobe *GoLive* or Microsoft *FrontPage*, or code the web site in HTML (Hypertext Markup Language), the programming language of the Internet. If a developer uses an authoring program to create a web site, the program generates the HTML code for the developer. After experimenting with several authoring programs, the author decided to code the web site in HTML because it allowed greater control over element placement and because the authoring programs, Microsoft *FrontPage* in particular, tended to add extraneous code when generating the HTML.

A final factor in the design was consideration of the lowest common denominator in user computers and browsers.

Designers need to take into account different browser versions, computer download speeds, and monitor resolutions when developing a site. A high percentage of Pacific's student population is low-income. Less than one-half of the students have a computer with Internet access at home, and many of the computers have older browsers that will not support newer features like frames, JavaScript, and Flash. (Frames divide a page into different, independently scrollable sections, JavaScript is a programming language that adds extra functionality to a web page, and Flash is used to add high-level animation to a page.) The download speed of different computers can greatly impact the speed at which web pages load. Images should be kept to a minimum and image file sizes kept small to accommodate slower download speeds. Many older monitors do not support resolutions above 800 x 600 pixels. A web page designed to fit higher resolutions will not fit within the boundaries of an 800 x 600 monitor, forcing a user to scroll sideways. To ensure greater access to the Pacific High School web site, the author opted not to use frames, JavaScript, or Flash, and images were compressed to minimize file size. Although the initial page size was too wide to fit a monitor resolution of

800 pixels wide x 600 pixels high, this was later adjusted to accommodate lower resolutions (see Layout Changes section below).

Layout Changes

Approximately one year after the web site was launched, the design layout was changed somewhat (see Figure 8) to address several problems. First, the width of each page was reduced from 745 to 660 pixels. This ensured that every page would display on an 800 pixel wide monitor without necessitating a user scroll sideways. (Because of the added widths of browser window borders and vertical scroll bar, a 745 pixel wide web page does not entirely fit on an 800 pixel wide monitor.) Reducing the page width also guaranteed that all pages would fit within normal printer dimensions. Second, the color of the navigation bar along the left edge of each page was changed to a darker purple. While the previous purple displayed well on the author's computer, it came across quite bright and overpowering on other computers. The darker purple appeared more muted and aesthetically pleasing on a greater number of monitors than did the first purple. Third, the base font for the title bar was changed from Harrington to Skia. Harrington has a lot of serifs, and

the author felt it was too busy. The author chose Skia because she felt its clean lines were more befitting the professional image she wanted to convey. Fourth, the navigation links across the top of the page were moved below the title bar. The added white space at the top of each page gave the layout a less cramped feel and contributed to a better sense of balance.

The screenshot shows a web page with a dark header bar containing the title "Safety Information" in a stylized font. Below the header is a navigation menu with links: HOME, SCHOOL INFO, STAFF, STUDENTS, PARENTS, CALENDARS. On the left side, there is a vertical menu of links: Campus Security, SBCUSD Safety Page, School Rules, On Campus Suspension (OCS), Internet Safety, Staff Handbook (pdf), Student Handbook (pdf), Safety Links, District Crisis Response Team, Download Combustibles PowerPoint. The main content area features a circular icon of a fire extinguisher and a "Spotlight on Safety" section. This section discusses the school's focus on safety, mentioning Vice Principal Wendell Lake and security officers Gary Carlson and Don Watson. Below this is a large heading "Safety Begins With You" followed by a detailed paragraph about safety resources provided on the website, including links to safety policies, CPR, health, home safety, street safety, district safety page, Powerpoint presentation, local hospitals, law enforcement agencies, fire departments, Internet safety tips, kid-safe browsers, articles on Internet safety, an online game about Internet safety, and School Rules page and OCS page. At the bottom, there is a note for questions or suggestions regarding these safety resources, directing users to email the webmaster.

Figure 8.

Revised Web Site Layout

Content

In determining content to be included in the web site, the author analyzed existing information needs and resources for staff, students, and parents. The content was then gathered from school board policies, staff and student handbooks, staff meeting presentations, the school's master schedule, the school's master calendar, school and district directories, historical documents about the school, and web searches. While some content, such as board and school policies, could be copied directly from its source, a large portion of the content had to be composed by the author based on information gleaned from several sources. This composition process increased the development time of the project, but it ensured uniformity of narrative style throughout the web site.

The information contained in Pacific's web site is varied and quite comprehensive. The Staff and Student sections have weekly announcements detailing meetings, student activities, sporting events, and campus visitors. Monthly calendars and a yearly calendar are also posted to provide long-range information. A staff roster is available that lists names, room assignments, telephone extensions, e-

mail addresses and job descriptions to facilitate communication between staff and parents. The master schedule and course syllabi are posted showing what each teacher teaches every period, and descriptions of the school's departments, programs, and services are also provided. Site staff development information and staff meeting agendas are posted on the Staff Development page. Information about arrival and departure times, textbooks, supplies, copies, credentialing, salary, benefits, retirement, field trips, requesting a substitute, teachers' unions, and California Education Code is available in the Just for Teachers section. School and district policies on everything from technology use to dress code to discipline are posted in the Policies section. Detailed graduation requirements, college entrance requirements, and information on financial aid and college entrance exams are provided in the Student and Parent sections. Descriptions of all standardized tests administered at Pacific High School along with test scores from prior years and links to testing resources are presented on the Standardized Testing page. Bell schedules, final exam schedules, sports schedules, and two maps of the school--one

showing room assignments and the other showing evacuation routes--are also posted.

In addition to the content mentioned above, three resource sections are provided with a host of links to other web sites. Gathering content for these sections--Teacher Links, Parent Links, and Living in the Inland Empire--was particularly time consuming, as the author had to locate and evaluate hundreds of web sites for inclusion. The web sites were evaluated based on the following criteria: 1) correlation to state content standards, blueprints, and frameworks, 2) grade appropriateness of content, 3) readability level of content, 4) site organization, 5) ease of navigation, 6) inclusion of graphics, sound, or animation where appropriate, and 7) aesthetic appeal.

Each resource section contains a wealth of information. The Teacher Links pages have sections on curricular areas (English/language arts, math, science, social studies, fine arts, career technical, foreign language, and physical education) along with teacher helps and lesson plans, technology, special education, GATE, and current events. The Parent Links page has sections on parenting resources, health and wellness, safety and product recalls, homework help,

financial resources, career, and government. The Living in the Inland Empire pages include sections on different cities, apartment and house listings, transportation, utilities, entertainment, hospitals and medical centers, hiking and camping, newspapers, libraries, and shopping--everything a teacher or family new to the area would need to settle in.

The author also wanted to incorporate several feedback forms into the web site. One form would allow Pacific alumni to submit information to be included in the online alumni index, another would permit students to submit responses to a weekly web poll, another would enable staff members to submit purchase requests or transportation requests online, and the last would allow visitors to give feedback about the web site. While the previously mentioned content (i.e., calendars, master schedule, staff roster, announcements, policies, etc.) could be built with basic HTML and JavaScript, advanced programming capabilities are needed to get the forms to work as intended. The author tried to set up the forms using JavaScript, but JavaScript form capabilities are limited in that a user must have an e-mail account configured on the computer he/she is using for form submission to work. If a user views Pacific's web site on a

public library computer, for example, he/she would get an error message when trying to submit a form. In addition, due to server differences among ISPs, the JavaScript "Submit" function does not always work, even on computers configured for user e-mail accounts. Because of the author's limited knowledge of more advanced web programming, she was unable to get the forms to work as intended and eventually removed them from the site.

Site Usability and Maintenance

After the site was completed, the author began testing all internal and external links. The size of the web site and the number of external links made this a complex and lengthy process. Once all links were verified, the web site was uploaded from the author's computer to a folder on the district web server, and Pacific's web site was operational at the following address:

<http://misnt1.sbcusd.k12.ca.us/pacific>.

Over the course of the next year, the author solicited and received feedback on the web site from staff, parents, students, and alumni via e-mail and personal contact (see Appendix A for the survey form). Most of the feedback was very positive and complimentary, and the suggestions for

improvement were, for the most part, minor--just typos, broken links, and comments about information not being current. One staff member commented several times on the purple color being too bright, and the author noticed the same problem as she viewed the web site on various computers in different classrooms. The author also observed that the web pages were too wide for the older monitors on campus. At this point, despite the time involved in making such a change, a decision was made to revamp the web site layout as described in the Layout Changes section above. The conversion took a couple of months to complete, but was, in the author's opinion, well worth the effort. The revised layout is cleaner, more professional in appearance, and accommodates a larger number of monitor resolutions.

The author encountered several other issues while maintaining the web site the first year. The site was meant to be a living, breathing entity with its content kept as current as possible. Once the information was initially input, keeping the content current did not require a lot of time. The author updated the staff, student, and parent announcements once a week, and updated other information as needed. Major updates to the staff roster, master schedule,

sports schedules, and calendars were required at the start of the second year, however, but once those were complete, maintenance time again diminished.

A final challenge was regularly verifying the external links. While checking these throughout the year, the author found several links that were no longer active and one link that had changed from a math resource site to a pornography site. Keeping up with these changes was difficult but a necessary evil--necessary to prevent users from becoming frustrated with a web site that does not work.

Summary

The development of the project took longer than anticipated, but several factors emerged as paramount in the design process. First, carefully planning the site architecture prior to web site construction is the key to a successful navigation scheme and organized site. As the old saying goes, "an ounce of prevention is worth a pound of cure." Once a solid structure is in place, a designer can easily fit in new pages and concepts; and a well-designed architecture naturally generates an effective navigation scheme. Second, testing a layout in different browsers and

on different computers--Macintosh and PC, old and new--before a site is fully implemented, is vital. The time and effort spent to revise Pacific's layout would not have been necessary had the author followed that advice. Third, consistent maintenance of external links and time-sensitive content is crucial to ensuring repeat visitors. The author did not receive feedback when content was kept current, but people did comment when the author was late updating the announcements or calendars.

CHAPTER FOUR
RECOMMENDATIONS FOR CONSTRUCTION
OF A SCHOOL WEB SITE

Introduction

Construction of any school web site should follow the six steps outlined in the previous chapter: 1) define the populations to be served, 2) design the site architecture and navigation scheme, 3) create the site layout or "look and feel," 4) gather and input content, 5) evaluate the site usability, and 6) upload and maintain the site. While the web site discussed in this project was designed for a high school, the aforementioned steps are applicable to any school level. An elementary or middle school web site may not have the depth of content contained in a high school or college web site, but the design process should be the same.

Steps in Web Site Construction

Define Populations to Be Served

The development process for a web site is similar to the writing process. As an author prepares to write, he must identify a purpose and audience for his writing (Tompkins, 1994). Is he writing to entertain, to inform, or to

persuade? To whom are his comments to be addressed? What is the average reading level of his audience? Clearly, a children's book would not be written with the same vernacular and sentence structure as a college textbook. A web designer should follow the same premise in determining the purpose and audience for a web site.

A school web site need not target students, staff, and parents, as the site described in this project did. A developer may choose to concentrate on students and staff with a repository of online curriculum. He or she may choose to emphasize school policies and procedures for an audience of primarily parents. Regardless of content, an audience should be clearly identified prior to site construction.

Design Site Architecture and Navigation

Once an audience and purpose are established, a general structure should be developed around the considerations listed below.

- 1) What information will the web site contain?
- 2) How will the information be organized?
- 3) How will users navigate through the information?
- 4) How are different topics related and how will they be linked?

- 5) If the site is designed to address more than one group of people, is there overlap in the information to be presented to the different groups?
- 6) What navigational commonalities will be included to allow users to return to familiar territory from anywhere in the site?

Ease of navigation can make or break a web site, so considerable time should be invested in this stage of the development process. Additionally, a well-designed architecture can facilitate site expansion should new information need to be added later.

A flow chart is useful in detailing a web site's architecture and navigation scheme. In addition to providing a developer with a physical representation of a site's information organization, a chart like the one shown in Appendix A can later be used to develop a site map or index.

Create Site Layout

While the architecture and navigation scheme make up the internal workings of a web site, the layout is the external representation of a site. A user's first impression of a site is typically based on the site's layout or "look and feel," so a web designer should take great care to employ the

design principles of unity, focal point, balance, and rhythm to create a clean, aesthetically pleasing layout. The author recommends looking at other professionally created web sites for layout and color scheme ideas. Analyzing other sites helps a designer develop his or her personal style and gives the designer a better sense of how to apply the principles of design.

To maintain a uniform appearance throughout the web site, the layout should remain consistent from page to page. Consistency does not necessitate that all pages look exactly alike. It does, however, imply that certain elements, i.e., color, font, and spacing, are woven through every page. All pages in a web site should look like they belong together.

As described in Chapter Three, each page of the Pacific High School web site has a solid purple bar running the length of the left edge. On most pages, the width of this bar is approximately 160 pixels. On the "Staff Roster and Master Schedule" pages (see http://misnt1.sbcusd.k12.ca.us/pacific/staff/roster_ac.html), however, the bar is 100 pixels wide; and on the "Map of Pacific High School" page (see <http://misnt1.sbcusd.k12.ca.us/pacific/schoolinfo/map.html>), the bar is only 20 pixels wide. The width differences do not

disrupt the site's overall look and feel because enough other elements remain in common from page to page. For example, the color of the bar is the same throughout the site, as are the header style and font.

Gather and Input Content

Depending on the size of the web site, this phase may be the most time consuming and tedious part of the development process. In contrast with the first three stages, however, gathering and inputting content does not require a lot of higher-level thinking. This phase can be monotonous and very time intensive, but having a well thought out site architecture, navigation system and layout greatly eases the input process. Gathering content is simplified by the identification of the audience and purpose in the first step, because the designer has a guide to follow in selecting the content.

Evaluate Site Usability

An appealing layout, solid architecture, and useful content are paramount to web site efficacy; however, if users are not able to navigate a site due to broken links or missing pages, the effectiveness of the web site is immediately diminished. All of a web site's links—internal

and external—should be tested prior to the site's launch, and once the site is live on the Internet, all external links should be regularly re-verified. The phrase "here today and gone tomorrow" is very applicable to the Internet, as web sites are created, changed, and deleted everyday.

Consistently testing all external links ensures that a site does not have links to web pages that no longer exist.

Another facet of evaluating web site usability involves perusing the site in various web browsers on both Macintosh and IBM compatible computers. As previously noted, pages render differently in different browsers in different operating systems. While creating a web site that appears the same in all conditions may not be possible, a designer should at least minimize glaring inconsistencies.

A final evaluative consideration is user feedback about the site. Soliciting feedback from the site's intended audience is very useful in determining if the site truly addresses the desired purpose. Based on user comments, the web developer can adjust site content, fix broken links, or modify layout attributes to make the site more user friendly.

Upload and Maintain the Site

After a site has been thoroughly tested on a local computer, all web pages and graphics associated with the web site must be uploaded to a web server. While the author's school district has its own web server on which she was allowed to post her school's web site, this may not be the case in all districts.

If no web server is readily available in a school district, the web developer must find a company willing to host the site. Many Internet service providers (ISPs) like AOL, Earthlink, and MSN offer free web hosting to their customers. Free web hosting such as this is typically limited to sites between 5 MB and 50 MB, with additional space provided for a small fee. In addition to ISPs, hundreds of other companies across the country provide fee-based web hosting. Prices for these services vary depending on the amount of space needed and the extra services and technical support provided by the company.

When selecting a hosting entity, one should consider the reliability of the web server. A server that frequently has problems (due to being overloaded, poorly maintained, old, etc.) will discourage and frustrate new and returning users.

Visitors are less likely to return to a site if they repeatedly receive error messages about the server being down.

Once a site is up and running, the web master should regularly update any time sensitive content and evaluate external links. This maintenance is paramount to encouraging repeat visits. Why would a user return to an online calendar page if the calendar's information is weeks or months old? Why would a parent revisit a web page describing school events if the page still lists "Back to School Night" in December? Why would students use a resource page with a collection of science links if most of the links do not work. To maximize its usefulness, a school web site needs to be consistently monitored and updated.

CHAPTER FIVE

CONCLUSIONS

Introduction

Hypermedia affords a wealth of design possibilities with its inherent nonlinear structure. A high school web site, one application of hypermedia, can provide various audiences (i.e., students, staff, and parents) with instant access to a wide range of information. The nature of a web site allows this information to be easily and quickly updated and disseminated without the costs and time associated with updating and distributing something tangible like a book, pamphlet, or CD. Because of this instant access to timely information, a school web site is an excellent avenue to promote communication among members of a school community.

Conclusions

In crafting this project, the author concluded several things about school web site development.

1. Planning is the key to a quality web site.

Investing substantial time and thought in site architecture, navigation, content, and layout

makes web site construction and subsequent expansion much easier.

2. Ease of navigation strongly impacts a web site's usability. Few visitors will return to a site that is confusing to navigate. A site's navigation system should be easy to follow and consistent throughout. A user should be able to return to familiar territory from any page on a site without having to use the "back" button on the web browser.
3. During development, web pages should be tested under a variety of conditions, i.e., different browsers, operating systems, monitors, and connection speeds. A web page that looks fantastic in *Internet Explorer* on a Macintosh computer may appear shockingly different in *Netscape* on an IBM-compatible machine. A page that fits perfectly on a 1200 x 1600 resolution monitor will overwhelm a 600 x 800 resolution screen. Images that load in a couple of seconds on a T1 or DSL connection will load excruciatingly slowly through a 28.8 modem connection. The web

developer must find a happy medium that works well on as many systems as possible.

4. Once a site is launched, content should be consistently updated. Time sensitive information, like calendars and announcements, should be kept current to encourage repeat visits, and links to external sites should be regularly checked to verify their validity.
5. While a web site can be built with only limited knowledge of HTML programming or web authoring software, advanced programming capabilities are needed to add true interactivity to a web site. Some interactivity can be added with JavaScript, but the advanced capabilities of CGI scripts and programming languages like PERL are needed for more complex functions.

Summary

Creating and maintaining a solid high school web site requires many hours of planning, preparation, coding, and monitoring. Much of the work is tedious--during and after construction--but the payoff is a site that is user friendly,

easily navigable, and filled with useful content. The real advantage of the web site, however, is manifested through two facets that differentiate it from other media. First, once established, the site can be easily updated when needed, and new content instantly disseminated for worldwide access at relatively little cost. Second, the non-linear structure of a web site allows each user to customize a search path through the information with just the click of a mouse. Hypermedia, and more pointedly, the Internet are prominent elements of our society, not likely to fade in the near future. A high school web site harnesses the power of hypermedia and the Internet to the great benefit of a school and its community.

APPENDIX A
PACIFIC HIGH SCHOOL WEB SITE
FLOW CHART

HOME

SCHOOL INFO

- School history
- School programs
- Vision statement
- Expected learning results
- Principal's message
- Registrar and transcripts

STAFF

- Weekly announcements
- Calendar of events
- E-mail logon
- District e-mail addresses
- Staff development
- Staff handbook
- Just for teachers
- Living in the Inland Empire
- Teacher links
- Technology

STUDENTS

- This week in sports
- Events of the week
- Calendar of events
- Student handbook
- Graduation requirements
- College info
- Student assistance programs
- Counselors
- Alumni

PARENTS

- Parent links
- Dates to remember
- Calendar of events
- Admin
- Counselors
- Pacific phone numbers
- District phone numbers

CALENDARS

- Monthly calendars
- Yearly calendar
- Finals schedule
- Holidays and breaks

TESTING

- Descriptions of tests
- Testing schedule
- Testing links

STAFF ROSTER/
MASTER SCHEDULE

POLICIES

- Attendance
- Discipline
- Graduation
- Health and Safety
- Field trips
- Technology
- Dress code
- Registration

SPORTS

- Team descriptions
- Coaches
- Sports schedules
- Sports links

APPENDIX B
SURVEY OF PACIFIC HIGH SCHOOL
WEB SITE

SURVEY OF PACIFIC HIGH SCHOOL WEB SITE
<http://misnt1.sbcusd.k12.ca.us/pacific>

This survey is part of a study being conducted by Keri Freestone for the purpose of completing a master's project for California State University, San Bernardino (CSUSB). The master's project addresses the creation and use of a high school web site, and the Institutional Review Board at CSUSB has approved the research for this study. Participation in this study is purely voluntary, and all responses will be kept anonymous and confidential. Each participant has the right to withdraw his/her participation and data from the study at any time without penalty. The researcher does not foresee any immediate or long-range risks to participants, but anticipated benefits include a more user-friendly and functional web site for staff, parents, and students. Any questions about participants' rights should be directed to the researcher.

Participant Information

I am a:

- Parent
- Student
- Pacific High School staff member
- Other: _____

I used the following web browser to look at Pacific's site:

- Internet Explorer
- Netscape
- AOL
- Other: _____

I viewed the web site with a monitor resolution of:

- 640 x 480
- 800 x 600
- 1024 x 768
- 1200 x 1600
- Other: _____

I viewed Pacific's web site on a:

- PC
- Macintosh

I was connected through:

- 14.4 modem
- 28.8 modem
- 56K modem
- DSL
- T1 or higher

I typically visit Pacific's web site:

- Daily
- Once a week
- Once a month
- Several times a year
- This is my first visit.

Web Site Design

	Agree		Disagree		
	1	2	3	4	5
The amount of pictures and clip art on the web site is adequate.					

Comments: _____

The pictures and clip art are appropriate to the subject matter on each page.	1	2	3	4	5
---	---	---	---	---	---

Comments: _____

The size and scale of the pictures and clip art are appropriate.	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

The color scheme used throughout the web site is visually appealing.	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

The font, size, color and style of text are visually appealing.

	Agree		Disagree		
	1	2	3	4	5

Comments: _____

The size and style of the text do not interfere with legibility.

	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

The wait time for pages to load is acceptable.

	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

I was able to view the entire width of each page without scrolling sideways.

	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

I would suggest the following changes to the web site **design:**

Web Site Navigation

	Agree		Disagree		
	1	2	3	4	5

The site was well organized and easy to navigate.

Comments: _____

The site's navigation scheme was easy to determine.

	Agree		Disagree		
	1	2	3	4	5

Comments: _____

I was able to navigate without feeling "lost" in the site.

	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

I was able to quickly find any desired information.

	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

I was able to easily return to previous pages without using the "back" button.

	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

I had a good sense of where I was in the site at all times.

	1	2	3	4	5
--	---	---	---	---	---

Comments: _____

I would suggest the following changes to the web site **navigation:** _____

Web Site Content

Agree **Disagree**

The content was appropriate for a high school web site. 1 2 3 4 5

Comments: _____

The content was well organized. 1 2 3 4 5

Comments: _____

The content was up to date. 1 2 3 4 5

Comments: _____

The calendars showed relevant events for students, staff, and parents. 1 2 3 4 5

Comments: _____

The content wording was clear and easy to understand. 1 2 3 4 5

Comments: _____

Appropriate contact information was easily accessible. 1 2 3 4 5

Comments: _____

All internal and external links worked. 1 2 3 4 5

Comments: _____

I would suggest the following changes to the web site
content: _____

Do you have any other suggestions to improve the web site?

REFERENCES

- Abell, S.K., et. al. (1996). Integrated media classroom cases in elementary science teacher education. *Journal of Computers in Mathematics and Science Teaching*, 15(1/2), 137-151.
- Adams, P.E. (1996). Hypermedia in the classroom using earth and space science CD-ROMs. *Journal of Computers in Mathematics and Science Teaching*, 15(1/2), 19-34.
- Allen, P.S. & Stimpson, M.F. (1990). *Beginnings of Interior Environment: Sixth Edition*. New York: MacMillan Publishing Company.
- Burch, R.O. (2001). Effective web design and core communication issues: The missing components in web-based distance education. *Journal of Educational Multimedia and Hypermedia*, 10(4), 357-367.
- Caro, D. (2001). School library web site: This virtual library is always open. *Colorado Libraries*, 27(3), 7-8.

- Chagas, M.I. & Abegg, G.L. (1996). Teachers as innovators: A case study of implementing the interactive videodisc in a middle school science program. *Journal of Computers in Mathematics and Science Teaching*, 15(1/2), 103-118.
- Child, D.A. (1999). The effects of system response time on user behavior in a hypermedia environment. *Journal of Educational Multimedia and Hypermedia*, 8(1), 65-87.
- Clyde, A. (2002). Creating the school library web site. *Teacher Librarian*, 29(3), 25-28.
- Evans, C. & Edwards, M. (1999). Navigational interface design for multimedia courseware. *Journal of Educational Multimedia and Hypermedia*, 8(2), 151-174.
- Ewing, J.M., Dowling, J.D., & Coutts, N. (1999). Learning using the world wide web: A collaborative learning event. *Journal of Educational Multimedia and Hypermedia*, 8(1), 3-22.
- Ford, N. & Chen, S.Y. (2000). Individual differences, hypermedia navigation, and learning: An empirical study. *Journal of Educational Multimedia and Hypermedia*, 9(4), 281-311.

- Grabe, M. & Grabe, C. (1998). *Integrating Technology for Meaningful Learning, Second Edition*. Boston: Houghton Mifflin Company.
- Helgeson, S.L. & Kumar, D.D. (1993). A review of educational technology in science assessment. *Journal of Computers in Mathematics and Science Teaching*, 12(3/4), 227-243.
- Heller, R.S. (1990). The role of hypermedia in education: A look at the research issues. *Journal of Research on Computing in Education*, 22(2), 431-441.
- Jensen, E. (1998). How Julie's brain learns. *Educational Leadership*, 56(3), 41-45.
- Jonassen, D.H. (1996). *Computers in the Classroom: Mindtools for Critical Thinking*. Englewood Cliffs, NJ: Prentice Hall.
- Lightfoot, J.M. (2000). Designing a "full-service" classpage on the internet. *Journal of Educational Multimedia and Hypermedia*, 9(1), 19-33.
- Lincoln University. (1999). *Conditions of learning*. [online]. Available: <http://www.lincoln.ac.nz/educ/tip/18.htm>

Lowery, L. (1998). How new science curriculums reflect brain research. *Educational Leadership*, 56(3), 26-30.

Marsh, E.J. & Kumar, D.D. (1992). Hypermedia: A conceptual framework for science education and review of recent findings. *Journal of Educational Multimedia and Hypermedia*, 1, 25-37.

McDonald, S. & Stevenson, R.J. (1999). Spatial versus conceptual maps as learning tools in hypertext. *Journal of Educational Multimedia and Hypermedia*, 8(1), 43-64.

Misanchuk, E.R., Schwier, R.A., & Boling, E. (2000). Discourse on designing an illustrated hypermedia book. *Journal of Educational Multimedia and Hypermedia*, 9(3), 223-251.

Nixon, M. (2002). How the web keeps parents 'in the know.' *T.H.E. Journal*, 29(9), 58-60.

Palfrey, S. (2000). Creating a school web site. *Principal*, 79(3), 14-17.

Reutzel, D.R. & Cooter, R.B. Jr. (1992). *Teaching Children to Read*. New York: Macmillan Publishing Company.

Senn, G.J. & Horton, P.B. (1996). The effects of hypermapping and embedded prompts on biology achievement and completion rate of hypermedia courseware. *Journal of Computers in Mathematics and Science Teaching*, 15(1/2), 35-47.

Shaw, T. (2002). The school web site: A servant to many masters. *Multimedia Schools*, 9(5), 48-49.

Shepardson, D.P. & Britsch, S.J. (1996). When dinosaurs roamed: Hypermedia and the learning of mathematics and science. *Journal of Computers in Mathematics and Science Teaching*, 15(1/2), 7-18.

Simkins, M. (1996). Spread your good news with a school web site. *Thrust for Educational Leadership*, 26, 13.

Szabo, M. & Kanuka, H. (1999). Effects of violating screen design principles of balance, unity, and focus on recall learning, study time, and completion rates. *Journal of Educational Multimedia and Hypermedia*, 8(1), 23-42.

Terry, T.M. (1999). Weaving the web into biology teaching. *BioScience*, 49(9), 733-741.

Thompson, A.D., Simonson, M.R., & Hargrave, C.P. (1996).

Educational Technology: A Review of the Research, Second Edition. Washington, D.C.: Association for Educational Communications and Technology.

Tomlinson, C. A. & Kalbfleisch, M. L. (1998). Teach me, teach my brain: A call for differentiated classrooms.

Educational Leadership, 56(3), 52-55.

Tompkins, G. E. (1994). *Teaching Writing: Balancing Process and Product*, Second Edition. New York: Macmillan College Publishing Company.

Wisnudel, M. (1994). Constructing hypermedia artifacts in math and science classrooms. *Journal of Computers in Mathematics and Science Teaching*, 13(1), 5-15.